

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of:

Rich Fogal and Michael B. Ball

Serial No.: 09/422,887

Filed: October 21, 1999

For: ANGULARLY OFFSET STACKED DIE  
MULTICHIP DEVICE AND METHOD OF  
MANUFACTURE

§ Group Art Unit: 2822  
§  
§ Examiner: J. Brophy  
§ Atty. Docket: 95-0134.05

APPLICANTS' BRIEF ON APPEAL

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Appendix 1: Copy of Involved Claims

Appendix 2: *In re Vickers*, 141 F.2d 522, 61 U.S.P.Q. 122 (C.C.P.A. 1944)

Appendix 3: *Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 3 U.S.P.Q.2d 1737 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 954 (1987)

## APPLICANTS' BRIEF ON APPEAL

### I. REAL PARTY IN INTEREST

The captioned Applicants, Rich Fogal and Michael B. Ball, have assigned their interest in this application to Micron Technology, Inc.

### II. RELATED APPEALS AND INTERFERENCES

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There are no other appeals or interferences known to the Applicants, the Applicants' attorney, or the assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

### III. STATUS OF THE CLAIMS

Claims 1-17 have been presented during prosecution of the application under appeal.

Claims 1-6 were cancelled by the Preliminary Amendment.

Claims 7-17 are rejected.

Claims 7-17 are on appeal.

### IV. STATUS OF THE AMENDMENTS

Applicants filed no amendments subsequent to the latest rejections.

### V. SUMMARY

Exemplary embodiments of the claimed invention concern a method of stacking a plurality of dies, wherein each die is angularly offset with respect to the orientation of an underlying die. (Specification page 5, lines 21-22, and Figures 1 and 3.) Angular offsetting is accomplished by rotating a die within a plane that is parallel to the underlying die. (*Id.* at page 5, lines 23 and 24; page 4, lines 4-5.) The amount of rotation is described in terms of an angle

between the longitudinal centerlines of one die and its underlying counterpart. (*Id.* at page 6, lines 1-3.) Moreover, the disclosure teaches that, in some embodiments, it is preferable to offset a die at an angle that is as small as possible without blocking access to the underlying die's bond pads. (*Id.* at page 5, lines 21-23; page 6, line 3.) A minimum angle is especially preferable if it is desired to stack the maximum number of dies while still ensuring clearance for the wire bonds leading to each die. (*Id.* at page 6, line 6 (designating the maximum number of dies as "N"; page 4, lines 6-8 (discussing ensuring that a lower die's bonding sites are not obstructed by an upper die); page 5, line 28 – page 6, line 1 (indicating that die are stacked without interfering with the vertical line of sight of lower dies' bonding pads.)) In a preferred embodiment, wire bonding of all bonding sites occur during the same wire bonding process. (*Id.* at p. 5, ln 29 – p. 6, ln. 1.)

## VI. ISSUES

There are three issues for determination on appeal.

- (1) Whether the scope of claims 13-17 is sufficiently enabled under §112, ¶1.
- (2) Whether claims 7-17 are novel under 35 U.S.C. §102 in light of de Givry (European Patent No. 489,643); and
- (3) Whether claims 13-15 and 17 are novel under 35 U.S.C. §102 in light of Fogal (U.S. Pat. No. 5,323,060)

## VII. GROUPING

Applicants define the following groups of claims for consideration upon this appeal.

These groups correspond to the issues listed above.

Group I:	Claims 13-17
Group II:	Claims 7-17 (The claims of this group do not fall together.)
Group III	Claims 13-15 and 17 (The claims of this group do not fall together.)

## VIII. ARGUMENT

The Examiner rejected various groups of claims under §112, ¶1; §102 citing de Givry; and §102 citing Fogal. Applicants address each basis for rejection separately below.

### A. The scope of claims 13-17 is sufficiently enabled under §112, ¶1.

The Examiner rejected claim 13 and its dependent claims 14-16 for including the limitation “ensuring at most a minimum bond pad clearance” and rejected claim 17 based on the limitation requiring “less than a maximum underlying bond pad clearance.” The Examiner attempted to support the rejection by arguing that the claims are broad enough to include within their scope an embodiment that the Examiner does not believe is enabled by the Specification. Specifically, the Examiner envisioned an embodiment wherein the bond pads are covered by an overlying chip. Applicants contend that case precedent supports a finding that the claims are adequately supported. Specifically, Applicants cite *In re Vickers* (141 F.2d 522, 61 U.S.P.Q. 122 (C.C.P.A. 1944)), where the examiner of that application rejected claims because, although they covered an embodiment disclosed in the specification, they also covered a mechanical apparatus that was *not* disclosed in the specification. (*Id.* at 61 U.S.P.Q. 124, 127. Copies of this and other cases cited herein are included in appendices to this Response.) The Court indicated that such a rejection is not in accordance with the applicable rule, namely: it is not necessary to disclose each specific embodiment of the invention covered by the claims; rather, in a mechanical case, broad claims may be supported by disclosure of a single form of the apparatus disclosed in an application. (*Id.* at 127.)

The relevant facts of the current application are analogous to those in *Vickers*. As in that case, the Examiner has argued that the rejected claims cover matters that are not addressed in the specification. However, it is undisputed that the claims are supported by embodiments addressed in the specification. Hence, the rule in *Vickers* applies to the mechanics of claim 13’s stacking chips and claim 17’s arranging dies, thereby indicating that those claims satisfy 112’s enablement requirement.

Additional case precedent provides further support. In *Spectra-Physics, Inc. v. Coherent, Inc.* (827 F.2d 1524, 3 U.S.P.Q.2d 1737 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 954

(1987)), the relevant patents were invalidated for lack of enablement based on their failure to disclose a particular brazing cycle relevant to the patents' laser technology. (*Id.* at 3 U.S.P.Q.2d 1743.) The Federal Circuit, however, noted that the specifications identified alternatives to that cycle. (*Id.*) In finding sufficient enablement, the Federal Circuit pointed out that “[n]onenablement is the failure to disclose *any* mode” (*id.* at 1744 (emphasis in original)) and added that

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[i]f an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment . . . and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed . . .

(*Id.* at 1743 (citations omitted).)

The relevant facts of the current application are again analogous. Specifically, the invention pertains to the relatively predictable art concerning the mechanics of stacking chips and arranging dies. Further, it is undisputed that Applicants have disclosed multiple embodiments -- more than the “single embodiment” required by the Court in *Spectra*. Hence, given the modes that the specification does disclose and the standard set forth by the Court in *Spectra*, the claims cannot be rejected for lack of enablement.

As support for the rejection, the Examiner cited section 2164.08 of the MANUAL OF PATENT EXAMINING PROCEDURE (MPEP). A careful reading of the language in that section, however, actually supports Applicants' position. That section addresses the requirement that enablement be commensurate in scope with the claims. In analyzing whether the claims meet this requirement, this MPEP section acknowledges that “not everything necessary to practice the invention need be disclosed.” (*Id.* at ¶2.) Rather, certain omissions are allowed in light of (1) the abilities of one skilled in the art; and (2) acceptable amounts of experimentation. (*Id.*) That paragraph further indicates that “the scope of enablement need only bear a ‘reasonable correlation’ to the scope of the claims.” Additional paragraphs within the main section of 2164.08 further emphasize the focus of the abilities of one skilled in the art and acceptable amounts of experimentation in determining whether the claim scope is enabled. (*Id.* at ¶3, ¶4, ¶5, ¶12.) Section 2164.08(b) of the MPEP further indicates that the “presence of inoperative embodiments within the scope of a claim does not necessarily render a claim nonenabled.” The

MPEP goes on to remind the Examiner that the “standard is whether a skilled person could determine which embodiments that were conceived, but not yet made, would be inoperative with expenditure of no more effort than is normally required in the art.” (*Id.*) Assuming only for the sake of argument that the Examiner has managed to articulate an inoperative embodiment, the Examiner’s mere identification of such is insufficient to reject the claim for failure to enable. Rather, the Examiner must then consider the standard addressed immediately above – whether a skilled person could determine that embodiment would be inoperative with expenditure of no more effort than is normally required in the art. Applicants contend that the Examiner’s failure to do so amounts to a failure to meet the *prima facie* burden for rejection.

Moreover, the Examiner’s argument actually suggests that the *prima facie* burden cannot be met. Specifically, it is significant that the Examiner appears to be able to argue which embodiments would be inoperative. The Examiner’s efforts suggest that a skilled person could make the same argument. Further, because mechanical arts have been characterized as predictable (*see Vickers and Spectra*), one skilled in the art of mechanics concerning stacking chips and arranging dies would be able to reach the Examiner’s conclusion with expenditure of no more effort than is normally required in the art. Thus, when the abilities of the ordinary artisan are considered in combination with the predictable nature of the relevant art (as they must be under MPEP §2164.08) the MPEP standards for enablement scope are satisfied.

The Examiner has raised substantially similar §112 arguments in several of the previous Office Actions. (*See* Office action dated 7/2/2 at p. 2-3; Office action dated 10/17/01 at p. 2-3; Office Action dated 11/16/00 at p. 2-3.) As a result, Applicants have raised counter arguments substantially similar to those presented above. Accordingly, the latest Office Action, dated 7/2/2, also contains a response to Applicants’ counterarguments. Applicants address the Examiner’s response below.

First, the Examiner began by offering an interpretation of MPEP §2164.08. (Office Action dated 7/2/2 at p. 5.) Applicants contend that the Examiner’s interpretation ignores the MPEP’s express focus on the abilities of one skilled in the art, the acceptable amounts of experimentation, and the predictability of the relevant art, all of which Applicants addressed above. Applicants contend that the Examiner’s failure to address such factors makes the Examiner’s interpretation of the MPEP untenable. Further, the Examiner failure to address

§2164.08(b) – previously raised by Applicants -- supports reversal on policy grounds, as discussed below.

The Examiner subsequently argues that the current specification teaches away from embodiments wherein a chip's bond pads are covered by an overlying chip. (Office Action dated 7/2/2 at p. 5 (citing ¶[0009] and ¶ [0010] of the Specification.) A careful reading of the cited portions of the Specification, however, refutes the Examiner's interpretation. Paragraph [0010] is only one sentence – the first sentence -- in the Summary. That sentence concerns two dice in a stack attached to a substrate prior to wire bonding. Accordingly, paragraph [0009] focuses on background art wherein a first die on the substrate is wire bonded before a second die is stacked thereover. (Specification at ¶[0009], first sentence, third sentence, fourth sentence, fifth sentence.) The only other two sentences merely indicate that the clearance allowed in prior art risks wire loop interference. (*Id.* at second sentence, sixth sentence.) Applicants contend that, when considered as a whole, the Examiner's citation cannot reasonably be interpreted in the manner purported by the Examiner.

The Examiner then attempted to distinguish the *Vickers* case from the facts on appeal. (Office Action dated 7/2/2 at p. 5-6.) In attempting to do so, the Examiner appears to offer contradictory interpretations of the case. First, the Examiner argues that "in the *Vickers* case, everything within the scope of the claims was supported by the specification." (*Id.* at p. 6.) However, immediately thereafter, the Examiner indicated that a specific embodiment in *Vickers* was not taught by the specification. (*Id.*) Applicants contend that such contradiction should discourage the Board from attempting to apply the Examiner's argument. Further, based on Applicants' *Vickers* analysis found above, Applicants submit that *Vickers* (1) addresses the scope of enablement issue (contrary to the Examiner's conclusion); (2) is analogous to the facts on appeal; and (3) supports a finding that the appealed claims' scope is adequately enabled.

Applicants also note that the Examiner's response failed to address the applicability of the *Spectra* case, which was also addressed in an earlier response. (See Response to the Office Action dated 10/17/01 at p. 3-4.) The Examiner's failure further supports reversal on policy grounds, as discussed below.

Accordingly, and without comment on the specific scope of the rejected claims or the actual operability of the embodiment envisioned by the Examiner, Applicants request that the Board reverse the Examiner, withdraw the §112 rejections, and allow the claims.

B. Claims 7-17 are novel in light of de Givry.

The Examiner rejected the appealed claims as being anticipated by de Givry (European Patent 489,643). ~~Applicants contend that the relevant claims in their current state contain~~ limitations that de Givry fails to disclose. Moreover, Applicants note that the claims contain different limitations, and there are rejection bases and supporting arguments that do not necessarily apply to every claim in this group. Hence, the claims do not necessarily fall together.

1. Claims 7-8.

Claim 7, for example, requires defining a *minimum* angular offset with the act of mounting an upper die on a lower die. Although the Examiner previously cited de Givry's figure 1 in an attempted §102 rejection, the Examiner tried to support the latest rejection by citing de Givry's figure 3 and accompanying text. (Office Action dated 7/2/02 at p. 3; *compare with* Office Action dated 10/17/01 at p. 3.) The Examiner subsequently raised an argument concerning the Specification's value "α;" a hypothetical number of die; and the angles formed between de Givry's die in FIG. 3. (*Id.* at p. 6.) Applicants contend that, regardless of the Examiner's hypotheticals, De Givry's figure 3 as well as other figures and its text emphasize providing a maximum chip-crossing angle. It is noteworthy that de Givry indicates that the mere crossing of chips is superficial and does not itself save space. (de Givry translation at p. 4.) Such crossing, however, does define "dead areas" between the chips, where auxiliary components may be located. (*Id.* at p. 4, 6.) Thus, crossing the chips indirectly allows for a denser package. (See *id.* at p. 3-4.) It follows that minimizing de Givry's cross angle would risk providing space between the chips that is insufficient to accommodate an auxiliary component, thereby removing the true benefit that de Givry purports to offer. Further, de Givry emphasizes adding supports under the ends of its chips in order to avoid a cantilevering effect. (*Id.* at 4, 6; figure 1, 3.) Applicants contend that minimizing de Givry's cross angle would interfere with the ability to

provide such support. This emphasis is further highlighted in de Givry's figures 1 and 2, wherein crossing sets of 2 chips defines 90 degree angles; and figure 3, wherein crossing a set of 4 chips defines 45 degree angles. Such angles are the maximum angles at which the chips in their respective sets could be crossed. Thus, when read in context, de Givry discloses only the exact opposite of claim 7's limitation and further actively discourages achieving that limitation. As a result, de Givry cannot be read to anticipate that claim or dependent claim 8.

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## 2. Claims 9-11

Claim 9 requires ensuring that the act of stacking *all* dies of a multichip module occurs with no intervening bonding step. Claim 10 requires stacking *all* dies of a multichip module before bonding wire to the dies. Claim 11 requires bonding wire to a multichip module's dies only after stacking *all* of those dies. The Examiner attempted to support the rejection of these claims by citing de Givry's fig. 3 and p. 7, ¶3 of the translated specification, which discloses attaching four chips, then carrying out "cabling." (Office Action dated 7/2/02 at p. 4.) Thus, the Examiner appears to be currently arguing that de Givry's stacking *four* chips, then cabling, is tantamount to stacking *all* of a module's chips, then cabling.

Significantly, the Examiner has previously interpreted de Givry as disclosing the exact opposite -- admitting that "de Givry does not teach that the bonding step is performed after all of the dies have been stacked." (Office Action dated 11/16/00 at 6 (admitting that de Givry fails to anticipate claims 9-11).) The Examiner's previous interpretation of de Givry's translated disclosure is in accordance with de Givry's teachings when taken as a whole. Specifically, it is noteworthy that de Givry generally warns that stacking all of a module's chips before any wiring takes place is unworkable because the machines used to perform the wiring are capable of accommodating only a limited difference in elevation between the ends of a wire. (de Givry translation at p. 7, ¶1.) As a result, de Givry generally teaches stacking dies into a first discrete set, then wiring the dies in that set, then stacking a second set on the first, then wiring the dies in the second set, etc. (*Id.* at ¶2.) Thus, when considering the Examiner's own prior statements and further considering the de Givry citation in context with the rest of de Givry's teachings, the Examiner's current argument is shown to be untenable. Rather, reading the newly cited portion in context with the rest of the translated disclosure suggests that attaching a set of four chips and then

cabling will be followed by de Givry stacking an additional set thereon and performing additional cabling. Such an interpretation offers the added benefit of avoiding conflict with the Examiner's previous position. This interpretation also demonstrates that de Givry discloses only the exact opposite of the limitations in claims 9-11. As a result, de Givry cannot be read to anticipate those claims.

Applicants have raised this argument in response to the previous Office Action. (See Response to the Office Action dated 10/17/01 at p. 8.) Applicants contend the argument remains viable and warrants withdrawing the rejection of claims 9-11. In the latest Office Action, the Examiner responded to this previously raised argument by attempting to recant the earlier admission concerning de Givry's teachings. (Office Action dated 7/2/02 at p. 6-7.) Specifically, the Examiner attempts to argue that the admission concerned the embodiment in de Givry's figure 1 rather than the figure 3 embodiment now being applied. However, a careful reading of the admission refutes the Examiner's argument. Significantly, the text of the admission is not expressly limited to the embodiment in de Givry's figure 1. (See Office Action dated 11/16/00 at p. 6.) Further, the text of the admission does expressly refer to elements (chips 14 and 16) found in de Givry embodiments in addition to that in figure 1. (*Id.* See also de Givry at FIG. 2; FIG. 3.) More significantly, the Examiner referred to "any two" dies as a subset of "all of the dies," thereby indicating that the Examiner was referring to de Givry embodiments other than (or at least in addition to) the two-chip embodiment of figure 1. (Office Action dated 11/16/00 at p. 6.) Applicants submit that the clear language of the admission renders the Examiner's attempt to recant unpersuasive.

The Examiner then reiterated the belief that de Givry's figure 3 disclosure of stacking *four* chips, then cabling, is tantamount to stacking *all* of a module's chips, then cabling. Applicants reiterate that de Givry generally teaches stacking sets of chips, with a cabling/welding process carried out on each set before the next set is stacked. Thus, when read in context, de Givry implies that attaching a set of four chips and then cabling will be followed by stacking an additional set thereon and performing additional cabling.

The Examiner further responded by arguing that de Givry's teachings concerning cabling/welding between stacking sets of chips applies to de Givry's figure 2 embodiment rather than the figure 3 embodiment relied upon for rejection. (Office Action dated 7/2/02 at p. 7.) However, it is significant that the text addressing de Givry's figure 3 analogizes the embodiment

therein to the one in figure 1 (de Givry translation a p. 7, ¶ 3, last line), which in turn allows for cabling between stacking sets of chips (*id.* at p. 6, last ¶). Thus, the Examiner's attempt to limit the application of de Givry's teachings is in conflict with de Givry's clear language, demonstrates the Examiner's failure to consider de Givry's teachings in context, and conflicts with the previous interpretation that the Examiner has failed to adequately recant.

### 3. Claim 12

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Claim 12 requires *marginally* clearing a line of sight to contact areas of any immediately underlying die. Further, a careful analysis of de Givry indicates that it fails to disclose the limitation "marginally clearing a line of sight" when discussing the orientation of the chips in de Givry's stack. Specifically, as mentioned in part 1 above, the true benefit of de Givry's invention is to provide for a sufficient amount of "dead areas" between the chips, where auxiliary components may be located. (Translation of de Givry at p. 4, 6.) Altering the crossing angle to anything less than the maximum risks leaving space between the chips that is insufficient to accommodate an auxiliary component. This would, in turn, adversely affect density and frustrate the main point of de Givry. (*See id.* at p. 3-4.) Further, altering the crossing angle to anything less than the maximum risks difficulty in providing the supports de Givry touts for avoiding cantilevering. (*Id.* at 4, 6; figure 1, 3.) As a result, de Givry should be interpreted as disclosing only the exact opposite of the limitation in claim 12. Accordingly, de Givry cannot be read to anticipate that claim.

### 4. Claim 13-16

Claim 13 requires, in addition to spiraling a plurality of chips, ensuring at most a minimum bond pad clearance to each chip of the plurality. The Examiner concludes that de Givry's figure 3 discloses ensuring at most a minimum bond pad clearance. (Office Action dated 10/17/01 at 4.) However, as addressed above in part 1, regardless of the number of chips de Givry includes in the stack, de Givry always ensures the *maximum* clearance, which helps to ensure adequate "dead space" between the chips and adequate support structures for the chip's ends. As a result, de Givry requires crossing two chips at 90 degrees (de Givry translation at 4-6; figure 1), three chips at 60

degrees (*id.*), etc. Such disclosure teaches only the opposite of the limitation expressed in claim 13 and incorporated into dependent claims 14-16.

### 5. Claim 17

Claim 17 requires *serially* stacking *all* dies of a multidie device. Although the Examiner previously cited de Givry's figure 1 in an attempted §102 rejection, the Examiner tried to support the latest rejection by citing de Givry's figure 3 and accompanying text. (Office Action dated 7/2/02 at p. 4; *compare with* Office Action dated 10/17/01 at p. 5.) However, Applicants submit that de Givry's disclosed cabling that occurs between stacking sets of chips interrupt the serial nature of stacking *all* the chips of de Givry's module. (See de Givry translation at p. 4, 7; *see also* the discussion in part 2 above.) Hence, de Givry discloses only the opposite of this limitation and therefore cannot anticipate the claim.

Claim 17 also requires establishing a unique orientation for each die, wherein that orientation defines *less than a maximum* underlying bond pad clearance. This limitation provides another instance of de Givry's failure to anticipate the claim, as de Givry's figures, including figure 3, illustrate the maximum angle at which chips in the same set could be crossed. For the reasons discussed above in part 1, this is not an accidental configuration but one that de Givry emphasizes to ensure sufficient space for auxiliary components and die support structures. As a result, de Givry teaches only the exact opposite of yet another limitation of claim 17, making the rejection even more untenable.

### C. Claims 13-15 and 17 are novel in light of Fogal

Applicants cited Fogal (U.S. Pat. No. 5,323,060) in an Information Disclosure Statement submitted on 10/21/99 as part of the original application documents. Despite such prompt citation, the Examiner did not reject claims under Fogal until the latest Office Action. (Office Action dated 7/2/02 at p. 4-5.) Applicants contend that the rejected claims 13-15 and 17 contain limitations not disclosed in Fogal. For example, claim 13 requires "spiraling a plurality of chips" around an axis as one act in a method of stacking chips. Dependent claims 14 and 15 further limit that act of spiraling. Although the Examiner argues that Fogal's chips 18, 28, and 54

illustrate spiraling, Applicants contend that a careful reading of Fogal demonstrates that no such spiraling is disclosed. Rather, each of Fogal's chips has the same orientation as every other chip in a particular stack. (Fogal at FIG. 1; FIG. 3; FIG. 4; FIG. 5; FIG. 6.) Applicants contend that such a configuration cannot be considered to satisfy any definition of the term "spiraling." Claim 17 requires, in addition to serially stacking all dies in a multidie device, establishing a unique orientation for each of those die. As mentioned above, each of Fogal's chips has the same orientation as every other chip in a particular stack. As a result, Fogal fails to meet the "unique orientation" requirement of claim 17. Further, claim 17 requires that the *orientation* define a certain degree of bond pad clearance. In Fogal, it is the adhesive thickness that defines bond pad clearance. (Fogal at col. 2, ln. 60-63.)

Applicants contend that the arguments presented above support the Board's reversal of the Examiner, withdrawal of the rejections, and allowance of the claims. However, Applicants also note that the independent claims benefit from different limitations and different supporting arguments, hence the claims in this group do not necessarily fall together.

D. The piecemeal and nature of Examiner's rejection and failure to answer all material traversed favors reversing the Examiner as a matter of policy

The Examiner's latest Office Action raises policy considerations that further support for allowing the appealed claims. The relevant language is in section 707.07 of the Manual of Patent Examining Procedure (MPEP). Significantly, section 707.07 of the MPEP is entitled

**Completeness and Clarity of Examiner's Action.**

(*Id.* emphasis in original). Subsection (f) is entitled

**Answer All Material Traversed**

and indicates that,

[w]here the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it.

(*Id.*)

One instance of the Examiner's frustration of the PTO's own policy concerns the Examiner's §112 rejection addressing enablement of claim scope. The Examiner raised this rejection in the Office Action dated 10/17/01 (p. 2-3). Applicants traversed the rejection, citing Spectra-Physics, Inc. v. Coherent, Inc. (3 U.S.P.Q.2d 1737) for the proposition that “[n]onenablement is the failure to disclose *any* mode.” (Response to the Office Action dated 10/17/01 at p. 3-4.) Applicants also cited MPEP §2164.08(b), which indicates that the “presence of inoperative embodiments within the scope of a claim does not necessarily render a claim nonenabled.” (*Id.* at p. 4.) The Examiner repeated the rejection in the subsequent (and latest) Office Action dated 7/2/02 (p. 2-3) yet failed to address how *Spectra* or MPEP §2164.08(b) refuted the rejection. Applicants contend that the Examiner's conduct demonstrates incompleteness of the Examiner's actions and, more specifically, a failure to answer the substance of Applicants' argument. Such conduct frustrates of the policy underlying MPEP 707.07(f). As a result, the Board's reversal of the Examiner, withdrawal of the rejections, and allowance of claims is supported as a matter of policy.

Another relevant portion of 707.07 is subsection (g), entitled

### **Piecemeal Examination**

which indicates that,

[p]iecemeal examination should be avoided as much as possible. The examiner ordinarily should reject each claim on *all valid grounds available*.

Applicants filed the application on 10/21/99, at which time claims 13-15 and 17 were added and the Fogal reference was cited in an IDS and in the Specification. Claims 13-15 and 17 have been in their current form since the Response transmitted 8/24/00. However, the Examiner failed to apply Fogal against claims 13-15 and 17 until the latest Office Action, dated 7/2/02.

The Examiner's delay is even more questionable when the Board considers that Fogal was cited as early as 8/16/95 in an IDS submitted as part of the original documents of the great-great grandparent application (Ser. No. 08/515,719). Given that the Examiner appears to believe that the §102 rejection based on Fogal is a valid ground, Applicants contend that such a rejection should have been raised in the first Office Action rather than in the fourth Office Action almost three years after filing.

Another reference cited 10/21/99 IDS was de Givry. Moreover, the Examiner has attempted to apply de Givry in every office action. However, in the first two office actions, the Examiner cited only de Givry's figure 1 embodiment against claims 7 and 17 and only de Givry's figure 2 embodiment against claim 8. (See Office Action dated 5/24/00 at p. 4-5; Office Action dated 11/16/00 at p. 5-6.) Significantly, the Examiner cited de Givry's figure 3 embodiment against other claims in those office actions. (*Id.*) In the third Office Action, the Examiner maintained de Givry's figure 1 and 2 embodiments as the main bases for rejecting claims 7&17 and 8 respectively. (Office Action dated 10/17/01 at p. 3-5.) The Examiner mentioned de Givry's figure 3 in relation to claim 17 only in response to Applicants' arguments. (*Id.* at p. 6.) Only in the latest Office Action, mailed almost three years after filing, did the Examiner affirmatively apply de Givry's figure 3 embodiment against claims 7, 8, and 17 as the main basis for rejection.

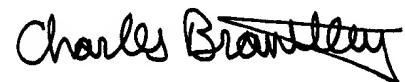
Applicants submit that the Examiner's failure to promptly raise the rejection bases addressed above serves as yet another example of incompleteness of the Examiner's actions and, more specifically, a failure to avoid piecemeal examination. As a result, the Board's reversal of the Examiner, withdrawal of the rejections, and allowance of claims is further supported as a matter of policy.

E. Conclusion

Applicants posit that, given the appropriate standards set forth by case precedent and the MPEP, claims 13-17 overcome the §112 rejections that the Examiner attempted to support. Further, based on the remarks presented above, Applicants submit that claims 7-17 contain limitations that support their novelty despite any of the references cited against them. Finally, Applicants contend that policy considerations further support the Board's reversal of the Examiner, withdrawal of the rejections, and allowance of the appealed claims. Applicants do so ask for such from the Board.

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Respectfully submitted,



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**Appendix I: Copy of Involved Claims**

7. A method of stacking a plurality of die, comprising  
mounting an upper die on a lower die; and  
defining a minimum angular offset with said mounting, wherein said minimum angular  
offset allows access to a bonding site on said lower die.

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8. The method in claim 7, further comprising a step of mounting a lowest die on a substrate.

9. A method of manufacturing a multichip module including dies, comprising:  
stacking all of said dies in a manner such that corresponding portions of any two of said  
dies define respective axes, and wherein said axes define an offset angle;  
bonding wire to said dies; and  
ensuring that said step of stacking all of said dies occurs with no intervening bonding  
step.

10. A method of manufacturing a multichip module including dies, comprising:  
stacking all of said dies, wherein corresponding portions of any two of said dies define  
respective axes, and wherein said axes define an offset angle; and  
bonding wire to said dies;  
wherein said step of stacking comprises stacking all of said dies before said step of  
bonding wire to said dies.

11. A method of manufacturing a multichip module including dies, comprising:  
stacking all of said dies, wherein corresponding portions of any two of said dies define  
respective axes, and wherein said axes define an offset angle; and  
bonding wire to said dies;  
wherein said step of bonding comprises bonding all of said wire only after said  
step of stacking all of said dies.

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12. A method of assembling a plurality of dies, comprising:  
stacking said plurality of dies along an axis;  
establishing an orientation for each die of said plurality of dies;  
marginally clearing a line of sight to contact areas of any immediately underlying die  
with said orientation for said each die, wherein said line of sight is parallel to said  
axis; and  
clearing a line of sight to contact areas of any underlying die with said orientation for said  
each die.

13. A method of stacking a plurality of chips  
spiraling said plurality of chips around an axis perpendicular to said plurality of chips;  
and  
ensuring at most a minimum bond pad clearance to each chip of said plurality of chips.

14. The method in claim 13, wherein said step of spiraling said plurality of chips around an axis  
further comprises spiraling said plurality of chips around an axis passing through said each chip.

15. The method in claim 14, wherein said step of spiraling said plurality of chips around an axis further comprises spiraling said plurality of chips around an axis passing through a center of said each chip.

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16. The method in claim 15, wherein said ensuring step comprises rotating a chip around said axis at least to an extent that a bond pad on an underlying chip is exposed.

17. A method of arranging all dies in a multidie device, comprising:  
serially stacking said all dies; and  
establishing a unique orientation for each die of said all dies, wherein said orientation for said each die defines less than a maximum underlying bond pad clearance.

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Appendix 2:

*In re Vickers*, 141 F.2d 522, 61 U.S.P.Q. 122 (C.C.P.A. 1944)

request for reconsideration of the board's decision, pointing out among other things that the "Endotherm" reference was improperly cited and relied on, since its publication date, November 1938, is subsequent to the filing date of appellant's parent application, July 27, 1936. On September 10, 1942 the board dismissed appellant's request for reconsideration for the reason that it had not had an opportunity to consider it until after appellant had filed his notice of appeal to this court on September 4, 1942. The board held that it had lost jurisdiction because of that appeal, citing *In re Allen, Jr.*, 28 C.C.P.A. (Patents) 792, 115 F.2d 936, 47 USPQ 471.

Appellant in his reasons of appeal did not specifically allege error against the reliance by the board on the "Endotherm" reference because of its late date, and for this reason that reference must be considered here for what it is worth. *In re Davis et al.*, 29 C.C.P.A. (Patents) 723, 123 F.2d 651, 51 USPQ 458.

Appellant was not required to file his notice of appeal as early as September 4, 1942 in view of the amendment to rule 149 which took effect on September 1, 1941, published at 6 F. R. 3923 and 529 O.G. 509, which provides that "if a petition for rehearing or reconsideration is filed within 20 calendar days after said decision, the notice of appeal may be given and the reasons of appeal filed within 15 calendar days after action on the petition."

Appellant concedes that it is old as shown in the prior art of record to utilize high-frequency energy for diathermy treatment. We are unable to see, however, that any of the prior art provides for a method of treatment whereby the fields in which the subject to be treated is placed are resonant within a closed chamber at a frequency characteristic of the chamber. None of the references disclosed an apparatus providing for a closed or substantially closed resonant chamber.

The only reference in the cited art showing an enclosure which may surround a patient is the Esau patent. There the subject is placed within a circular metal screen which may be of homogeneous metal or a plurality of parallel wires, open at the top. The screening is not connected with the electrical circuit and the patient is treated by means of plates situated opposite each other covering the portion of the body to be treated. It is stated in the patent that instead of the electric alternating field just described the magnetic alternating field can be used. That

magnetic alternating field, however, comprises the surrounding of the part to be treated with a coil not touching the part or the coil being in proximity to such part. It is obvious that such fields as have been described can be used simultaneously or separately. It is also stated in the patent that the reason for enclosing the body subjected to the short wave field with a metal screening is to avoid the loss of energy caused by sparking phenomenon at the electrodes, causing temperature increases in persons stationed near the patient of as much as  $1^{\circ}$  in an hour as the result of the displacement currents caused by the sparks. Therefore it is clear that the enclosure disclosed by the Esau patent is for a shield only and is intended to divert radiation so that it flows out of the ends of the wires of the shield, and likewise protect those who might be near the patient. The device of the Esau patent in our opinion does not anticipate the device defined by the claims, for the reason that instead of implying resonance in the shield the latter is not even part of the circuit. It appears to us that appellant's entire invention hinges on the maintenance of resonance within a chamber at its natural frequency characteristic, and we find nothing in the references which would make it obvious to one skilled in the art to construct the apparatus or use the method of appellant.

For the reasons heretofore stated the decision of the Board of Appeals is reversed.

31 C.C.P.A. (Patents) 985

Court of Customs and Patent Appeals

In re VICKERS AND HERMAN  
Appl. No. 4836 Decided Mar. 6, 1944

PATENTS

1. Claims—Broad or narrow—In general

Patentability—Anticipation—In general

Pleading and practice in Patent Office

Assuming that Office can reject broad claim merely because it covers one or more inoperative species, Court of Customs and Patent Appeals deems it proper

to say that Board has repeated that burden is on examiner to show that claim covers inoperative species, on applicant to show that it does

2. Specification—Sufficiency of disclosure—In general

In mechanical cases, broad claims may be supported by single form of apparatus disclosed in application; application may not disclose each specific embodiment covered by claims.

Particular patents—Pumping apparatus

Vickers and Herman, Oil Well Pumping Apparatus, claims 4, 12, 20, 37 of application allowed.

Appeal from Board of Appeals  
Patent Office.

Application for patent of H. Vickers and Kenneth R. Herman, No. 281926. From decision of claims 4, 12, 20, 21, and 37, appealed. Reversed.

BARNES, KISSELL, LAUGHLIN & (JOHN M. KISSELL and ROBERT CHOATE of counsel), all of Mich., for appellants.

W. W. COCHRAN (R. F. WHITE of counsel) for the Commissioner of Patents.

HATFIELD, Judge.

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming the rejection of claims 4, 12, 20, 21, and 37 in an application for a patent for an invention relating to new and useful improvements in oil well pumping apparatus.

Seventeen claims were allowed by the Primary Examiner.

Claim 4 is illustrative of the claims. It reads:

4. In combination, a cylinder containing an operating reciprocating member in said cylinder, means acting on said member for reciprocating the same, a cylinder, a motor cylinder, a reciprocating member in said motor cylinder to be operably connected to a rod of a pump in a well, a forming means, a pilot operating means adapted to control the flow of liquid through said pressure forming means, and a valve means connecting said cylinder and to and from said cylinder for the supply of operating liquid, and valve means connecting said cylinder and to and from said cylinder.

ating field, however, compounding of the part to be coil not touching the parting in proximity to such as that such fields as have can be used simultaneously. It is also stated in the reason for enclosing related to the short wave field. Screening is to avoid the caused by sparking between electrodes, causing increases in persons staying patient of as much as as the result of the discharges caused by the sparks. It is clear that the enclosure in the Esau patent is for a device intended to divert at it flows out of the ends of the shield, and likewise who might be near the device of the Esau patent does not anticipate the by the claims, for the instead of implying reso-shield the latter is not the circuit. It appears to applicant's entire invention maintenance of resonance member at its natural frequency, and we find no differences which would make one skilled in the art to apparatus or use the applicant.

Sons heretofore stated the Board of Appeals is re-

to say that Board has repeatedly held that burden is on examiner to show that claim covers inoperative species, and not on applicant to show that it does not.

## 2. Specification—Sufficiency of disclosure —In general

In mechanical cases, broad claims may be supported by single form of apparatus disclosed in application; applicant need not disclose each specific embodiment of invention covered by claims.

### Particular patents—Pumping Apparatus

Vickers and Herman, Oil Well Pumping Apparatus, claims 4, 12, 20, 21, and 37 of application allowed.

### Appeal from Board of Appeals of the Patent Office.

Application for patent of Harry F. Vickers and Kenneth R. Herman, Serial No. 281926. From decision rejecting claims 4, 12, 20, 21, and 37, applicants appeal. Reversed.

BARNES, KISSELLE, LAUGHLIN & RAISCH (JOHN M. KISSELLE and ROBERT A. CHOATE of counsel), all of Detroit, Mich., for appellants.

W. W. COCHRAN (R. F. WHITEHEAD of counsel) for the Commissioner of Patents.

HATFIELD, Judge.

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming the decision of the Primary Examiner rejecting claims 4, 12, 20, 21, and 37 in appellant's application for a patent for an alleged invention relating to new and useful improvements in oil well pumping apparatus.

Seventeen claims were allowed by the Primary Examiner.

Claim 4 is illustrative of the appealed claims. It reads:

4. In combination, a cylinder for containing an operating liquid, a reciprocal member in said cylinder, means acting on said member for resisting the entrance of liquid to said cylinder, a motor cylinder, a reciprocal member in said motor cylinder adapted to be operably connected to the sucker rod of a pump in a well, a pressure forming means, a pilot operated shiftable means adapted to control the direction of liquid under pressure through said pressure forming means and to and from said cylinders, a supply of operating liquid, unidirectional valve means connecting said supply

with the inlet of said pressure forming means, valve means responsive to movement of one of said reciprocal members for directing pressure to said pilot operated means to shift the same, and additional valve means responsive to abnormal movement of one of said reciprocal members resulting in closure of the outlet port of one of said cylinders adapted to delay the shifting of said pilot operated means, and thereby cause a replenishing of liquid from said supply to said system during said delay.

The claims were rejected by the tribunals of the Patent Office on the ground that they are broader than appellants' invention. They were not rejected on prior art.

There being no prior art involved, it is unnecessary that a detailed explanation of appellants' apparatus be here set forth. However, the Primary Examiner described appellants' apparatus quite fully in his statement to the Board of Appeals.

Appellants' apparatus includes a so-called "well operating or work cylinder" and piston, an accumulator cylinder and piston, and a pump which forces liquid from one cylinder to the other under control of a directional valve. The apparatus also includes two pilot valves. One, controlled by the accumulator piston, causes normal reversal shifting of the directional valve, and the other, by abnormal movement of the work cylinder piston which closes a port in the lower part of the work cylinder, delays normal reversal for replenishment purposes. (Replenishment is required because of leakage in the system.) Thus it will be seen that appellants' apparatus is an automatic system for reversal of a closed system and replenishment of liquid in the system.

It will be observed from what has been said that in appellants' apparatus one of the pilot valves is caused to operate by the accumulator piston, and the other by the work cylinder piston. The accumulator piston and the work cylinder piston move substantially in unison. Accordingly, the idea of actuating the valves in accordance with piston movement is obviously a unitary conception, and the operation of the system would be the same regardless of whether the accumulator piston or the work cylinder piston operates one or the other of those valves, provided the valves are operated for the purposes hereinbefore set forth.

In the apparatus defined by the appealed claims, the pilot valves may be

operated by the two pistons, as hereinbefore described, or they may be operated by a single piston.

The language of claim 4 which calls broadly for the operation of the valves either by a single piston or by two pistons is as follows:

valve means responsive to movement of one of said reciprocal members for directing pressure to said pilot operated means to shift the same, and additional valve means responsive to abnormal movement of one of said reciprocal members resulting in closure of the outlet port of one of said cylinders adapted to delay the shifting of said pilot operated means, and thereby cause a replenishing of liquid from said supply to said system during said delay. (Italics not quoted.)

In his statement to the Board of Appeals, the Primary Examiner said that, although the appealed claims read on appellants' disclosure, they were "incomplete" in that they omitted "a limitation without which" they were "broader than the disclosed invention," that is to say, they were sufficiently broad to call for the operation of the valves by a single piston. The examiner stated, however, that he would allow claims which defined the arrangement of the apparatus wherein "one piston by its movement controls the application of pilot pressure, while the other piston by its movement closes the inlet port of its cylinder to delay reversal." We quote from the examiner's statement as follows:

The claims on appeal, however, are even broader \*\*\* in that they merely state that one piston controls pilot pressure, and one piston delays reversal by causing closure of the outlet port of one cylinder. This language is broad enough to cover a construction wherein a single piston controls the pilot pressure and its own or the other cylinder's inlet port to also delay reversal. Whether it is possible to construct such a structure wherein a single piston performs all these functions, the Examiner cannot say. For present purposes, it seems sufficient to state that it is not immediately clear how it can be done, and applicants have not shown how to do it. Under such circumstances, it is believed proper to require applicants to reasonably restrict their claims to cover their own structure and obvious modifications thereof, while still leaving the field of improvement open to him who subsequently teaches the public how all the functions are to be performed by

the motion of only one of the two moving pistons.

Applicants have argued that it is possible that all reversing and delay functions could be performed by motion of one piston, and that to require them to limit the claims to recite that the control is under the motion of both pistons, would unduly limit their protection.

The answer to this is that if such a structure is possible, and is part of the invention disclosed in this case, applicants should have described it, if they desired to claim it. Having failed to describe it, and it is not being apparent how it can be brought about, it must be held to be outside the scope of the invention described herein, and applicants are not entitled to protection on it. (Italics quoted.)

In its decision affirming the decision of the Primary Examiner, the Board of Appeals called attention to the language in the body of claim 4, hereinbefore specifically referred to, and stated that the wording of the claim was confusing when read on the drawings in appellants' application; that appellants have not shown a construction, either in their drawings or in their specification, wherein a single piston might control the valves for the desired purposes; and that an entirely different and unobvious construction from that shown in appellants' drawings and specification would be necessary in order to control the valves by a single piston. The board further said:

The construction shown [in appellants' specification and drawings] requires two cylinders, the piston in [one] operating one valve means and the piston in the other operating the other valve means. \*\*\*

We are cognizant of the fact that in a mechanical case an applicant may generally draw a broad claim on a single construction. However, it should be obvious to any one skilled in the art to make such modifications covered. That is not the situation here.

It is contended here by counsel for appellants that the gist of the involved invention—

lies mainly in the particular valve arrangement for controlling reversal automatically and for permitting replenishment. It is not new to shift valves by extension of piston rods in this very art. We believe it plainly follows from this that it actually is obvious how the system could be

one of the two movements argued that it is reversing and delay performed by motion and that to require claims to recite that the motion of both only limit their protection.

is is that if such a claim is part of the in this case, applicants described it, if they

Having failed to is not being apparently brought about, it outside the scope of described herein, and entitled to protection quoted.)

forming the decision niner, the Board of ion to the language im 4, hereinbefore to, and stated that claim was confusing wings in appellants' spallants have not on, either in their their specification, ston might control sired purposes; and ent and unobvious that shown in ap and specification in order to control e piston. The board

ion shown [in application and drawings] iders, the piston in ne valve means and other operating the s. \* \* \*

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here by counsel for gist of the involved

he particular valve controlling reversal and for permitting is not new to shift on of piston rods in We believe it plainly is that it actually is a system could be

changed to have both valves \* \* \* controlled by a single piston rather than by both of them.

In explanation of how the apparatus might be arranged so that the valves would be properly controlled by a single piston, counsel for appellants state in their brief that it would seem to be obvious that the pilot valve, which is shown in appellants' specification and drawings as being controlled by the accumulator piston for causing normal reversal of the directional valve, might be operated by a projection from the piston in the work cylinder, or, instead of the port at the lower end of the work cylinder being closed by the work cylinder piston, it could be closed by a mechanical connection to the piston rod of the accumulator piston. Counsel's main contention is, however, that the "obviousness of various modifications [of the disclosure in appellants' specification] need not concern" the tribunals of the Patent Office; that it is the duty of those tribunals "to see that the claims are directed to novel and patentable subject matter," and that they are "readable on the disclosure." Counsel also contend that "To require an applicant to limit his claims to all obvious modifications, would either prevent him from receiving fair protection from his idea or it would cause him to multiply the disclosures of his patent to all the possible modifications that he could foresee in order that he could get broad claims," and that appellants are entitled to claims which cover "all devices which carry the spirit of the invention and are not shown by the prior art."

In support of their contentions, counsel for appellants rely upon the decisions in the following cases: In re Matzner, 20 C. C. P. A. (Patents) 799, 62 F.2d 190 [16 USPQ 25]; Ex parte Louis N. D. Williams, 2 USPQ 93; Ex parte Vickers, 53 USPQ 607.

In the Matzner case, *supra*, the invention involved related to radio receivers, and, among other things, disclosed means for "giving an electrical indication when the dial controlling the movable member of the condenser is in position to tune the receiver for a particular station." Claim 2, there involved, called for a dial for radio receiving sets, an electrical indicator, arranged in a normally open circuit and adapted to be rendered active only when the dial was set to tune in a station, and a circuit closing means, including a plurality of contact members "carried by the dial and disposed in circuit closing position only when the dial

is set to tune in a station." The Board of Appeals allowed certain claims, which, instead of calling for "contact members," called for "contact pins." In reversing the board as to certain of the claims there on appeal, we said [16 USPQ 27]:

We are of the opinion that the references do not show or suggest the useful result secured by appellant, either by the use of contact pins or in any other manner, and we therefore hold that appellant should not be restricted to the use of contact pins, but that he is entitled to a broader protection irrespective of whether the lamp circuit is closed by means of contact pins. (Italics not quoted.)

In the Williams case, *supra*, the Board of Appeals, in reversing the decision of the Primary Examiner rejecting the claims there on appeal, quoted from the decision in the case of *Ex parte Weaver*, 1897 C. D. 165, wherein the Commissioner of Patents said [2 USPQ at 96]:

It is the well-settled policy of this Office, however, to allow applicants to claim their invention as broadly as possible in view of the state of the art.

In the case of *Ex parte Vickers*, *supra*, the Board of Appeals, in reversing the decision of the Primary Examiner rejecting the single claim there on appeal, stated that the examiner had not rejected the claim on prior art, but had rejected it on the ground that it was broader than the applicant's disclosure because it was so drawn that it covered structures not specifically disclosed or described in the applicant's application. The board further stated [53 USPQ at 608]:

As a general rule an applicant in a mechanical case seldom shows more than one embodiment. He is generally allowed claims, when the art permits, which cover more than the specific embodiment shown. That practice is so general that it occurs in almost every case. \* \* \*

Even though the present applicant has not disclosed more than one specific arrangement of the controlling valve, we see no good reason why applicant should be denied a claim that will cover other arrangements as long as the claimed invention is novel. *The examiner has not shown that any other arrangement cannot be employed and obtain the equivalent result. It is our view that the claim is not too broadly drawn and that it should be allowed.* (Italics ours.)

The Solicitor for the Patent Office states in his brief that it is too well settled to require citation of authorities that "ordinarily in a mechanical case broad claims may be supported by a disclosure of a single form of the apparatus disclosed in an application." The solicitor contends, however, that the general rule as stated is not applicable to a claim which necessarily covers an apparatus working on a principle entirely different from that shown and described in an application, which apparatus is not suggested in the application and is not obvious from the disclosure therein. In support of those views, the solicitor cites the case of *Excelsior Drum Works v. Sheip & Vandegrift*, 173 F. 312, wherein it was stated by the District Court for the Eastern District of Pennsylvania that a broad claim could not be based upon a disclosure that was specifically limited to a single device which was not given as an example or as a preferred structure. It was also the view of the solicitor that it is not obvious from appellants' specification and drawings how appellants' apparatus might be reorganized so as to operate the valves by the movement of a single piston.

We are unable to concur in the view of the solicitor that appellants' specification does not suggest that the pilot valve for effecting normal reversal of the directional valve and the other pilot valve, which is so actuated as to delay normal reversal of the directional valve for replenishment purposes, could be operated by a single piston.

We quote from appellants' specification:

An object of the present invention is to provide a mechanism which is responsive to the movement of a reciprocal member in the pumping cylinder or the accumulator cylinder or both which will permit the operating liquid to be taken by the pressure forming means from an independent supply and injected into the closed system to replenish the supply of operating liquid. This replenishing apparatus is intended to operate automatically and is responsive to the quantity of liquid in the system. (Italics ours.)

It is apparent from the quoted excerpt that the accumulator piston may be used not only to effect normal reversal of the directional valve, but also to delay the operation of that valve for the purpose of replenishing the system. Accordingly, it is plainly suggested in appellants' specification that the accumulator piston

alone may operate the valves for the purposes set forth in the appealed claims.

Section 4888 of the Revised Statutes (U. S. C. title 35, sec. 33) requires an applicant to explain the principle of his invention and "the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions."

In construing that section, the Supreme Court of the United States in the case of *Continental Paper Bag Company v. Eastern Paper Bag Company*, 210 U. S. 405, 418, stated:

An inventor must describe what he conceives to be the best mode, but he is not confined to that. *If this were not so most patents would be of little worth.* "The principle of the invention is a unit, and invariably the modes of its embodiment in a concrete invention may be numerous and in appearance very different from each other." *Robinson on Patents*, Sec. 485. (Italics not quoted.)

That case, together with other decisions to the same effect, was cited and quoted from in the case of *In re Lester Kirschbraun*, 18 C. C. P. A. (Patents) 735, 44 F.2d 675 [7 USPQ 132].

In the instant case, appellants have described what they considered to be the best mode of operation of their apparatus and also an alternative mode of operation.

It will be recalled that the Primary Examiner held that the appealed claims read on appellants' disclosure, which they obviously do. The claims were not rejected because they cover all means of producing the desired result, or because of prior art. Nor were they rejected by the examiner because they cover an inoperative structure. Accordingly, it is unnecessary for us to discuss the question raised by counsel for appellants as to whether the tribunals of the Patent Office have authority to reject a broad claim merely because it may cover one or more inoperative species.

[1] Assuming, however, without deciding, that they have such authority, we deem it not improper to say that the Board of Appeals has repeatedly held that the burden is upon the Primary Examiner to show that such a claim covers an inoperative species, and not upon the applicant to show that it does not. See *Ex parte Rischdorfer*, 34 USPQ 338; *Ex parte Johnson*, 40 USPQ 576; *Ex parte Lilienfeld*, 44 USPQ 174; *Ex parte Korpum*, 50 USPQ 224; *Ex parte Vickers*, supra. See also rules 65, 66, and 135

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3 of the Revised Statutes § 35, sec. 33) requires an explain the principle of his "the best mode in which plated applying that prin- distinguish it from other

ng that section, the Su- of the United States in the ental Paper Bag Company aper Bag Company, 210, stated:

must describe what he be the best mode, but he ned to that. If this were patents would be of little principle of the inven- t, and invariably the modes diment in a concrete in- be numerous and in ap- pery different from each inson on Patents, Sec. 485. quoted.)

together with other deci- same effect, was cited and in the case of In re Lester 18 C. C. P. A. (Patents) 675 [7 USPQ 132]. ant case, appellants have t they considered to be the operation of their appara- in alternative mode of op-

recalled that the Primary l that the appealed claims ellants' disclosure, which do. The claims were not se they cover all means of desired result, or because Nor were they rejected by because they cover an in- cture. Accordingly, it is or us to discuss the ques- counsel for appellants as tribunals of the Patent itority to reject a broad

because it may cover re inoperative species. g, however, without decid- have such authority, we improper to say that the peals has repeatedly held n is upon the Primary Ex- w that such a claim covers species, and not upon the how that it does not. See dorfer, 34 USPQ 338; Ex , 40 USPQ 576; Ex parte USPQ 174; Ex parte Kor- Q. 224; Ex parte Vickers, also rules 65, 66, and 135

of the Rules of Practice in the United States Patent Office.

In his statement to the Board of Appeals, the examiner stated that appellants had not disclosed how a single piston could operate the valves; that it was not immediately clear to him how such an apparatus could operate; and that appellants had failed to describe such a structure in their application.

In other words, as we understand the examiner's decision, he held the claims to be too broad because the applicants did not disclose in their application each specific embodiment of the invention covered by the appealed claims. That holding was affirmed by the Board of Appeals.

Obviously, the decision of the Board of Appeals, as well as that of the Primary Examiner, is not in accordance with the rule as stated in the solicitor's brief, that is, "that ordinarily in a mechanical case broad claims may be supported by a disclosure of a single form of the apparatus disclosed in an application." Nor is the board's decision in conformity with the statement contained therein that "in a mechanical case an applicant may generally draw a broad claim on a single construction."

[2] In mechanical cases, such as that here involved, broad claims may be supported by a single form of the apparatus disclosed in an applicant's application. See In re Lester Kirschbraun, supra, and cases therein cited; Ex parte Kleinknecht, 49 USPQ 680; Ex parte Vickers, supra.

For the reasons stated, we are of opinion that the appealed claims were improperly rejected. Accordingly, the decision of the Board of Appeals is reversed.

copending, party second to file original and reissue is junior and must establish priority by preponderance of evidence.

## 2. Appeals to Court of Customs and Patent Appeals—Issues to be determined—Patent interferences

### Interference—Dissolution

Primary examiner denied party's motion to dissolve interference and granted opponent's motion to add count; at final hearing, Board of Interference Examiners held that additional reasons not included in party's motion to dissolve or in his opposition to addition of count could not be considered by it; such holding was in conformity with Rule 122; on appeal, Court may consider only reasons in motion to dissolve and opposition to motion to add count.

## 3. Appeals to Court of Customs and Patent Appeals—Issues to be determined—Patent interferences

Where appellate tribunal of Patent Office (in instant case, Board of Interference Examiners) construed counts broadly and holds that when so construed they are patentable over art, Court is bound by holding; patentability of such counts is for ex parte consideration by Patent Office.

## 4. Interference—Reduction to practice—Tests

Hearing aid device is not properly tested by holding it in position by hand rather than by head band.

### Particular patents—Audiphone

2077425, Lieber, Bone Conduction Hearing-Aid, reissue application awarded priority against application for reissue of 2144458, Koch, Bone Conduction Audiphone.

### Appeal from Board of Interference Examiners of the Patent Office.

Patent interference No. 77992 between Hugh Lieber, deceased, application, Serial No. 267932, filed April 14, 1939, for reissue of Patent No. 2077425 issued April 20, 1937 on application filed Dec. 24, 1932, and Henry Koch, application, Serial No. 314564, filed Jan. 18, 1940, for reissue of Patent No. 2144458 issued Jan. 17, 1939 on application filed Aug. 31, 1935. From decision awarding priority to senior party, junior party appeals. Affirmed.

HOGUET, NEARY & CAMPBELL (WALTER H. FREE and GEORGE H. COREY of counsel), all of New York, N. Y., for appellant.

S. MICHAEL PINELES (M. C. MASSIE of

31 C.C.P.A. (Patents) 979

### Court of Customs and Patent Appeals

KOCH v. LIEBER

Appl. No. 4793 Decided Mar. 6, 1944

### PATENTS

#### 1. Interference—Burden of proof

In interference between reissue applicants whose original applications were

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Appendix 3:

*Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 3 U.S.P.Q.2d 1737 (Fed. Cir. 1987),  
*cert. denied*, 484 U.S. 954 (1987)

, and ends on page 76. Plaintiff John Tenniel from page 77 to 84 of the same chapter. There is something about such a structural work. The plan for the entire is as yet uncompleted, is also odd. It appears that plaintiff has developed the illustration into the present. Again, such a presentation, structured chronologically, is copyrightable.

*Structure of "Treasury" is Not*  
*ally Similar to the Structure of*  
*ired World"*

It's finding above that plaintiff is to copyright protection for the structure of "The Pictured World" being, the Court also finds that no fact finder could determine that structure of "Treasury," and that is chapters, is similar to that of "red World." Unlike plaintiff's chapters of "Treasury" are organization, not by theme or school. The Court notes that each chapter is organized in the most basic of literary formats. Each chapter with a short summary of the g the illustrator in the context of and social climate of his or her each chapter turns to the life of a standard chronological sequence, for example, in the chapter of concerning Walter Crane, discussing the illustrator's childhood, career, his important relationship with Evans and the artist's later chapter culminates with a summa- artistic and personal accomplishment. Accordingly, the Court to reasonable fact finder could determine the structure of plaintiff's work, "red World" — even if copyrightable similar to that of "Treasury."

*Plaintiff's Selection and Presentation of Facts Contained within "The World" are not Copyrightable*

The Copyright Act of 1976, 17 U.S.C. § 107, and the law of this Circuit, can secure a copyright in the of materials and the marshalling contained in a factual compilation.

101 defines a "compilation" as

ned by the collection and assembling of materials or of data that are coordinated, or arranged in such a way that the work as a whole constitutes an work of authorship.

101.

*See, e.g., Eckes v. Card Prices Update*, 736 F.2d 859 [222 USPQ 762] (2d Cir. 1984) and *Financial Information*, *supra*, 751 F.2d 501, 506 [224 USPQ 632, 636]. In *Eckes*, the Second Circuit, focusing on the language of the Copyright Act, "selected, coordinated, or arranged," upheld the copyrightability of a baseball card guide referring to 18,000 or so different baseball cards because the authors exercised "selection, creativity and judgment" in choosing 5,000 of them as "premium cards." The Court of Appeals noted that:

[W]e have been particularly restrictive in the protection of non-fiction works indicating, for example, that the fruits of another's labor in lieu of independent research obtained through the sweat of a researcher's brow, does not merit copyright protection absent, perhaps, wholesale appropriation . . .

Nevertheless, our cases do not hold that subjective selection and arrangement of information does not merit protection.

736 F.2d at 862 [222 USPQ at 764]. Moreover, in *Financial Information*, the Second Circuit — while remanding to the trial court the inquiry of whether an aggregation of financial data constituted a copyrightable compilation — held that the "questions to be addressed will include whether the data used on [plaintiff's] cards involved a modicum of selection, coordination, or arrangement on [plaintiff's] part, sufficient to meet the rather broad copyrightability standard of originality which is phrased in terms of 'independent creation' rather than the narrower, inapplicable standards of 'uniqueness' or 'novelty' or 'ingenuity,' [citations omitted]." 751 F.2d at 507 [224 USPQ 636-637].

Plaintiff argues broadly that these cases support his copyright claim because defendants

took the selection and ordering of the facts in [plaintiff's] work, including the many quotations that plaintiff found from original sources which [defendants] appropriated. [Plaintiff] does not own a copyright in any individual fact or quote, but he does own a copyright in their collection together. If [defendants] appropriated that collection — which [plaintiff] assert[s] and defendants do not challenge here — than [sic] the overall claim of infringement [sic] on the individual passages is greatly enhanced.

P. Memo. at 47-48.

Plaintiff's reliance on *Eckes* and *Financial Information* as support for the aforementioned argument is misplaced. Those cases involved compilations of raw data — similar to directories or lists. The question asked by

the courts was whether this aggregation of pure data involved such selectivity on the part of the compiler to constitute originality. In the instant case, plaintiff's works are not compilations of data. Instead they are works of historical and artistic interpretation more properly analyzed under the approach formulated in *Hoehling*, *supra*, 618 F.2d 972 [205 USPQ at 681]. Accordingly, plaintiff's claim based on the "compilation" theory is also dismissed.

## CONCLUSION

For the aforementioned reasons, defendants' motion for summary judgment seeking the dismissal of plaintiff's complaint is granted. Plaintiff's cross-motion is denied. Accordingly, plaintiff's complaint is dismissed in its entirety.

SO ORDERED.

## Court of Appeals, Federal Circuit

Spectra-Physics Inc. v. Coherent Inc.

Nos. 86-1114 and 86-1133

Decided August 17, 1987

## JUDICIAL PRACTICE AND PROCEDURE

### 1. Procedure — Jury trials (§410.42)

Issue of whether patentee adequately disclosed best mode of carrying out invention, which was not decided by jury due to incorrect jury interrogatories, was properly decided by court, since, under Fed.R.Civ.P. 49(a), defendant's failure to object to incorrect interrogatories caused defendant to effectively waive right to jury trial on best mode issue, and thus court's findings as to best mode are reviewed under "clearly erroneous" standard of Fed.R.Civ.P. 52(a), rather than as denial of motion for judgment n.o.v. under Fed.R.Civ.P. 50(b).

### PATENTS

### 2. Patentability/validity — Adequacy of disclosure (§115.11)

#### Patent construction — Specification and drawings — In general (§125.1101)

Patent specifications which listed "TiCu-Sil" brazing, moly-manganese brazing, and low-temperature pulse-soldering as means of attaching copper cups to inside of ceramic tube in construction of ion laser were ade-

quate to satisfy enablement requirements of 35 USC 112, since disclosure of alternative methods would enable one skilled in art to make and use claimed inventions, but did not satisfy "best mode" requirements of Section 112, since specifications did not disclose six-stage TiCuSil brazing cycle developed by inventors and known to inventors as best means of attaching copper cups to ceramic tube.

**Particular patents — Lasers**

4,376,328, Mefferd, Method of Constructing a Gaseous Laser, holding of invalidity affirmed.

4,378,600, Hobart, Gas Laser, holding of invalidity affirmed.

**Appeal from District Court for the Northern District of California, Ingram, J.**

Action by Spectra-Physics Inc. for declaratory judgment stating invalidity and non-infringement of patents, and counter-claim by Coherent Inc. for patent infringement. From decision holding patents invalid, parties cross-appeal. Affirmed, on separate grounds; Archer, Circuit Judge, concurring in part with opinion.

Karl A. Limbach and Limbach, Limbach & Sutton, San Francisco, Calif., for appellant Coherent Inc. (J. William Wigert, Jr., Michael A. Stallman and Limbach, Limbach & Sutton, San Francisco, Calif., of Counsel.)

James W. Geriak and Lyon & Lyon, Los Angeles, Calif. (John M. Benassi, James H. Shalek, David B. Ritchie, Paul H. Meier and Lyon & Lyon, Los Angeles, Calif., with them on the brief) for appellee Spectra-Physics Inc.

Before Skelton, Senior Circuit Judge, and Rich and Archer, Circuit Judges.

**Rich, Circuit Judge.**

These are cross-appeals from the December 16, 1985, judgment of the United States District Court for the Northern District of California holding both of Coherent's patents in suit, No. 4,378,600 entitled "Gas Laser" issued on March 29, 1983, to James L. Hobart (the Hobart patent) and No. 4,376,328 entitled "Method of Constructing Gaseous Laser" issued on March 15, 1983, to Wayne S. Mefferd (the Mefferd patent), invalid for lack of enabling disclosure under 35 USC 112, first paragraph, after originally

entering judgment on a jury verdict finding claims 2, 5, 7, and 18 of the Hobart patent and claim 10 of the Mefferd patent valid and infringed by Spectra-Physics, Inc. (Spectra).

We reverse the district court's holding that both patents are invalid for lack of enablement. We also reverse, however, the court's finding that both patent specifications complied with the best mode requirement of §112, and thus affirm the judgment that the patents are invalid, but on a different legal ground.

Before discussing the legal aspects of this case, we first explain the technology involved which gave rise to them.

**Background**

*A. Ion Lasers — In General.*

The Hobart patent is directed to an ion laser structure and the Mefferd patent to a method of fabricating an ion laser. "Laser" is an acronym for light amplification by stimulated emission of radiation.<sup>1</sup> An ion laser is a type of gaseous laser. The lasing medium, typically argon or krypton gas, is contained within a sealed discharge tube which is axially aligned with a pair of mirrors to form the optical cavity or resonator.

For lasing to take place, the argon or krypton gas must be excited to elevated energy states. This is accomplished by providing a high-energy electrical discharge through the gas. The discharge through the laser must then be constrained to a straight line along the laser's optical path and pinched to a small diameter to concentrate its energy into a small elongated volume.

The discharge through the laser is extremely hot — up to 6000 °C. The exterior of the laser, however, must operate at room temperature, requiring dissipation of large amounts of heat by external cooling. It is also important that gas pressure be uniformly controlled along the discharge tube. For some reason, not entirely agreed upon by physicists, the gas tends to move to one end of the tube or the other. This phenomenon, known as "pumping," causes an uneven gas pressure differential in the discharge tube, resulting in poor performance or no performance at all.

<sup>1</sup> Webster's Unabridged Third New International Dictionary, which further defines laser as "a device that utilizes the natural oscillations of atoms for amplifying or generating electromagnetic waves in the region of the spectrum from the ultraviolet to the far-infrared including the visible region."

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ent on a jury verdict finding and 18 of the Hobart patent the Mefferd patent valid and Spectra-Physics, Inc. (Spectra), the district court's holdings are invalid for lack of *e also reverse, however, the that both patent specifications with the best mode requirement thus affirm the judgment are invalid, but on a different.*

*sing the legal aspects of this plain the technology involved to them.*

### Background Lasers — In General

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abridged Third New Interna- which further defines laser as "a zes the natural oscillations of ing or generating electromagnetic- egin of the spectrum from the far-infrared including the visible

### B. Hobart

The Hobart patent is directed to a gas laser having an improved laser discharge tube.<sup>2</sup> The discharge path of the laser is determined by coaxially aligned apertures in a series of spaced-apart tungsten discs within the laser discharge tube. The discharge tube itself is a thin-walled ceramic tube, for example, of alumina (Al<sub>2</sub>O<sub>3</sub>). Heat from the tung-

sten discs is transmitted by conduction to and through the ceramic tube (26), which is surrounded by a water jacket, by copper cups (50) attached to the inside of the tube. See Fig. 1 below, which is a dissected sectional view showing two end portions with a substantial portion of the central section omitted, the broken line representing the longitudinal axis.

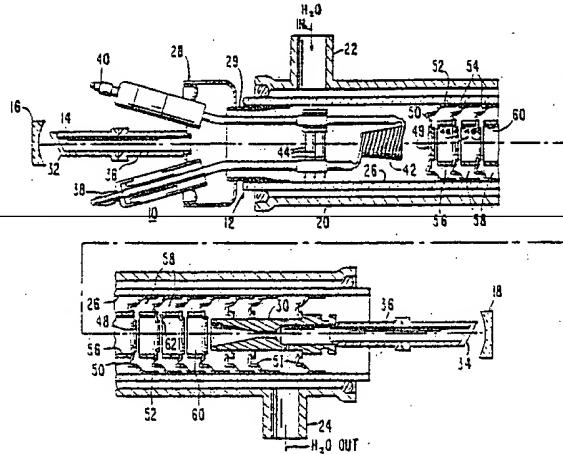


Figure 1.  
Cross-sectional View of Laser Structure

Claim 1 calls for "means for providing a heat conduction path from the central aperture of each of said discs to and through the tube wall." This includes both means for attaching the tungsten discs (48) to the center opening of each copper cup and means for

attaching the cups to the inside wall of the ceramic tube. High thermal conductivity is achieved by brazing or soldering which provides a permanent metallic contact between the cups and the tube wall.

The Hobart patent further discloses and claims a "shield" feature which is a cylindrical ring coaxially attached to or formed integrally with each of the copper cups.<sup>3</sup> These shields (56) aid in minimizing gas pumping within the discharge tube.

### C. Mefferd

The Mefferd patent describes a method of fabricating the laser structure of the Hobart patent.<sup>4</sup> The problem addressed in the Mef-

<sup>1</sup> Claim 1 of the Hobart patent reads:

1. A laser comprising:  
a gas-confining cylindrical tube made of a relatively thin-walled, electrically-insulating material;  
a plurality of spaced-apart discs within and generally perpendicular to the axis of said tube, each having a central aperture co-axially aligned with the axis of said tube to define a central discharge path;  
a plurality of cup-shaped members of a material having high thermal conductivity, each having a generally flat face and a generally cylindrical rim, and each having an opening in the middle of the face;  
means for providing a heat conduction path from the central aperture of each of said discs to and through the tube wall comprising means for attaching a disc at the periphery [sic, periphery] of the opening of each of the cup members and means for attaching the distal edge of each of the cup rims along the inside wall of said tube;  
means for exciting a gas within said tube; and  
an optical cavity aligned with said tube.

<sup>2</sup> Claim 2 of the Hobart patent reads:

2. A laser as in claim 1 herein each of said cup-shaped members includes a cylindrical ring gas barrier which is coaxially aligned with the central aperture and which extends within the volume of a cup-shaped member.

<sup>3</sup> Claim 1 of the Mefferd patent reads:

1. A method of fabricating a gaseous laser discharge tube comprising:  
assembling [sic] a plurality of spaced-apart heat-conducting members, each having a discharge defining central aperture generally aligned with the tube axis, within and in contact with an electrically-insulating tube;

ferd patent is how to insert and hold in place the heat conducting cups inside the long, slender tube, while at the same time maintaining the apertured discs in precise alignment. The patent discloses a "floating" disc technique whereby the disc apertures are aligned by tensioning a mandrel that has been passed through each of the disc apertures. Once the disc apertures are aligned, the whole assembly is brazed to permanently bond the parts within and to the tube walls. See Fig. 12 below in which the copper cups are 50, the shields 56, the discs 48, the mandrel 74 and the ceramic tube 26. The figure shows a partial assembly before the brazing of the discs to the cups, which is done in a vertical position with end "B" upward.

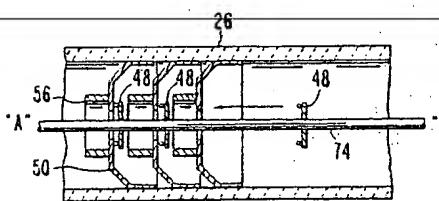


Figure 12.  
Cross-sectional View Illustrating Assembly  
of Cups and Discs Within Discharge Tube

#### D. The Importance of Braze

Both the Hobart and Mefferd patents stress the importance of the bond between the copper cups and the ceramic tube. Poor thermal contact between them results in higher disc temperatures which in turn impedes the gas flow through the tube. For the laser to be reliable, the copper-ceramic bond must also be able to withstand repeated heat cycling. Due to the differing rates of thermal expansion of copper and alumina, the bond is subject to compressive forces as the laser heats up and tensile stress during cooling.

Dr. Hobart initially approached the problem of how to make the critical copper to ceramic bond by experimenting with soldering. These attempts were unsuccessful and no attempt was made to even try to solder together any laser shaped parts. Wayne Mefferd was then brought in to solve the attachment problem. His solution was brazing.

While the patent specifications disclose pulse soldering as one method of attachment, brazing is clearly the preferred method. In

tensioning a mandrel provided through the central aperture to bring the central apertures into exact alignment; and

permanently securing the heat-conducting members to the electrically-insulating tube.

this process, a brazing shim 68, Fig. 4, is placed between the copper cup 50 and the inner wall of the ceramic tube 26, see Fig. 3, and the whole assembly is heated to the melting point of the braze material.

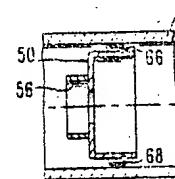


Figure 3.

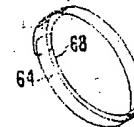


Figure 4.

During heating the cup is mechanically expanded into contact with the tube by means of an expansion tool inserted into tube 26.

The patents further disclose "TiCuSil" as the preferred braze material. This material is a copper silver eutectic (an alloy whose ingredients are proportioned to have the lowest possible melting point) with a small percentage of titanium added for making a ceramic to metal seal under what is known as the active metal process. In this process, the titanium invades and wets the ceramic so that the copper-silver braze material can hold the copper to the ceramic. In the absence of an active metal alloy component such as titanium, the ceramic must be premetallized with, for example, moly-manganese (MoMn), to provide a metallic surface to which the copper-silver braze material will adhere.

The TiCuSil active metal process is preferred because it requires only one step and avoids the need for premetallization. In addition, the copper cups cannot be electrically connected because this destroys the evenly graduated electrical potential down the bore of the tube which is required for the laser to operate. Thus, any premetallization must be in circular stripes along the inner surface of the tube so that each copper cup can be brazed or soldered to a different stripe.

#### E. Pattee Coherent's Six-Stage Braze Cycle

According to the standard product specification sheet, TiCuSil should be brazed at 850°C. The sheet also specifies that the braze should be performed in a vacuum or in a neutral atmosphere of dry argon gas. Using these general guidelines, Mefferd developed a six-stage braze cycle for using TiCuSil to attach the copper cups to the ceramic tube. "Braze cycle" is a term of art which refers to a process defined by specific parameters of temperature, length of times at given temperatures, atmosphere, and pressure.

brazing shim 68, Fig. 4, is the copper cup 50 and the ceramic tube 26, see Fig. 3, assembly is heated to the he braze material.

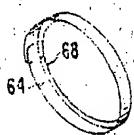


Figure 4.

cup is mechanically exact with the tube by means of a ring inserted into tube 26. Neither discloses "TiCuSil" as a brazing material. This material is eutectic (an alloy whose composition is known to have the lowest melting point) with a small amount added for making a seal under what is known as the process. In this process, the silver braze material wets the ceramic so that the ceramic can be brazed to the ceramic. In the above metal alloy component, the ceramic must be pre-treated, for example, molybdenum provides a metallic surface and the silver braze material will

active metal process is pre-treatment only one step and requires no premetalization. In addition, the cups cannot be electrically heated as this destroys the even potential down the bore. It is required for the laser to be along the inner surface of each copper cup can be d to a different stripe.

#### *Tentative Coherent's Six-Stage Braze Cycle*

The standard product specification for TiCuSil should be brazed at 750°C. It also specifies that the braze is performed in a vacuum or in a stream of dry argon gas. Using these guidelines, Mefferd developed a six-stage braze cycle for using TiCuSil to braze the copper cups to the ceramic tube. The term of art which refers to a braze cycle is defined by specific parameters of time, temperature, and pressure.

Mefferd knew that there were tradeoffs in the braze cycle. For one, it is generally desirable to heat the parts as fast as possible. As the parts are heated, however, "outgassing" occurs and contaminants trapped in the parts are released into the atmosphere of the oven. The vacuum pump removes the outgassed contaminants, but if the outgassing is too rapid, then the pressure may rise and the pump will not work. Also, if oxygen is evolved as part of the out-gas, the titanium may react with it and degrade the strength of the braze joint.

In assessing the tradeoffs, Mefferd let the pressure control the braze cycle, as one experimental approach. For example, Mefferd held the pressure in the oven at  $10^{-4}$  torr while the assembly was initially heated from 0 to 750°C. This took from an hour and a half to two hours. In the next step, he held the temperature at 750°C for ten to fifteen minutes while further reducing the pressure. The temperature was then increased for a period of approximately fifteen minutes until it reached 850°C. The remaining steps include holding the temperature at 850°C for a specified time and at a pressure of  $10^{-4}$  torr, decreasing the oven temperature to 750°C and adding argon gas, and then turning the oven off.

Mefferd's six-stage cycle produced a reliable braze joint between the copper cups and the ceramic tube. Because this approach worked, Coherent continued to use TiCuSil and never investigated the molybdenum process or further experimented with soldering. Neither the Hobart patent nor the Mefferd patent, however, discloses the braze cycle or any additional information on brazing copper to ceramic using TiCuSil.

#### *F. Spectra's "Cold Disc" Lasers*

Dave Wright, head of research at Spectra, and his technician Martin Riley, worked on so-called "cold disc" lasers of the type in suit in the late 1970's. They referred to these lasers as "cold disc" lasers because the process of brazing the copper cups to the ceramic tube provided good thermal conduction as contrasted with the earlier radiatively cooled lasers which ran hot. Wright and Riley, however, had only limited success with cold disc lasers, in part because they could not make a satisfactory bond between the copper cups and the alumina ceramic tube. Upon repeated heat cycling, the ceramic would crack and cause the copper to break away, overheat, and melt, which destroyed the operation of the tube. After two and a half years, Wright was unable to make a TiCuSil braze joint which was reliable enough for a

commercially acceptable product and Spectra temporarily abandoned the project.

Spectra resumed work on the cold disc project in 1981 after Coherent introduced its INNOVA laser embodying the inventions of the patents in suit. Because of their uncertainty about brazing, Spectra hired a brazing expert, Dr. Leonard Reed, to develop a molybdenum process for attaching the cups to the ceramic tube. After nearly a year of experimentation, Dr. Reed developed Spectra's proprietary molybdenum process. This involved using precision ceramic tubing and a special computerized striping tool which ground circular rings away from a coat of molybdenum metallization painted on the entire inside of the tube.

Spectra eventually introduced its Model 2020 gas laser which was made using the molybdenum process. Like Coherent's laser, each of the copper cups in the 2020 laser has a ring or shield to alleviate the gas pumping problem.

#### *The Decision Below*

Spectra brought a declaratory judgment action against Coherent asking a holding of invalidity and non-infringement of both patents. Coherent counterclaimed for infringement and an adjudication of validity.

After thirty-two days of trial, the district court submitted eighteen "Interrogatories to the Jury" and the jury answered fifteen of them, finding in part that Spectra's model 2020 laser infringed claims 2, 5, 7, and 18 of the Hobart patent and claim 10 of the Mefferd patent (the shield claims). The jury found that the remaining claims of both patents were invalid for obviousness or were anticipated by the work done by Wright and Riley at Spectra. The jury also found, however, that Wright and Riley had not reduced their cold disc laser to practice before conception of the subject matter set forth in the Hobart and Mefferd patents.

After entering judgment on the jury verdict, the district court withdrew the judgment and asked the parties to prepare proposed findings of fact and conclusions of law on several additional issues including disclosure of best mode and enablement under §112, co-inventorship of the shield claims by Dr. Rempel, another Coherent employee, and inequitable conduct. The court ruled in favor of Coherent on all of these issues except enablement. On that issue, the court held both patents invalid for failure to disclose the six-stage braze cycle used by Coherent to manufacture the laser. The court found that the best mode requirement was satisfied, however, because neither Hobart

nor Mefferd deliberately or accidentally concealed brazing as the best mode of attaching the copper cups to the ceramic tube.

Coherent appeals from the judgment with respect to lack of enablement and seeks reinstatement of the jury verdict that the shield claims are valid and infringed by Spectra. Coherent also appeals the portion of the judgment finding the remaining (non-shield) claims invalid for obviousness because of an erroneous jury instruction and requests a remand for a new trial on these claims.

Spectra cross-appeals from the judgment as it relates to best mode, inventorship of the shield claims, and derivation of the claimed subject matter from Wright and Riley. Spectra also appeals the denial of its request for attorney fees.

## OPINION

### 1. Introduction — Adequate Disclosure Under §112, 1st Paragraph

To constitute adequate disclosure under the first paragraph of 35 USC 112, a patent specification must set forth both the manner and process of making and using the invention (the enablement requirement) and the best mode contemplated by the inventor of carrying out the invention (the best mode requirement). The difference between these two is explained in *In re Gay*, 309 F.2d 769, 135 USPQ 311 (CCPA 1962):

The essence of [the enablement requirement] is that a specification shall disclose an invention in such a manner as will enable one skilled in the art to make and utilize it. *Separate and distinct* from [enablement] is [the best mode requirement], the essence of which requires the inventor to disclose the best mode *contemplated by him*, as of the time he executes the application, of carrying out his invention. Manifestly, the sole purpose of this latter requirement is to restrain inventors from applying for patents while at the same time concealing from the public preferred embodiments of their inventions which they have in fact conceived.

... The question of whether an inventor has or has not disclosed what he feels is his best mode is, however, a question separate and distinct from the question of the *sufficiency* of his disclosure to satisfy the requirements of [enablement].  
*Id.* at 772, 135 USPQ at 315. [emphasis in original].

Thus, compliance with the best mode requirement focuses on a different matter than does compliance with the enablement requirement. Enablement looks to placing the

subject matter of the claims generally in the possession of the public. If, however, the applicant develops specific instrumentalities or techniques which are recognized at the time of filing as the best way of carrying out the invention, then the best mode requirement imposes an obligation to disclose that information to the public as well. *See Flick-Reedy Corp. v. Hydro-Line Mfg. Co.*, 351 F.2d 546, 550-51, 146 USPQ 694, 697 (7th Cir. 1965), cert. denied, 383 U.S. 958 [148 USPQ 771] (1966); *Union Carbide Corp. v. Borg Warner Corp.*, 550 F.2d 355, 361-63, 193 USPQ 1, 6-7 (6th Cir. 1977).

The situation before us is one in which the patent specifications disclose more than one means for making the claimed invention, but do not adequately disclose the best means actually known to the inventors. The district court recognized that the specifications were inadequate under §112, but incorrectly based its decision on a lack of enablement. As we explain, the problem is really one of best mode, and thus, while we disagree with the district court's views on these issues, the judgment that the patents are both invalid was correct and must be sustained.

### 2. Enablement a. The Jury Question

Before addressing the substance of the district court's decision on enablement, we consider the question, raised by Coherent, whether the court was free to decide enablement at all without first considering the jury verdict. While no specific question was submitted to the jury on enablement, the district court instructed the jury that "invalid claims cannot be infringed" and provided general instructions on the law of enablement. Coherent maintains that by finding the shield claims infringed, the jury implicitly decided enablement in its favor, and that the court could not overrule these findings without making the determinations required by JNOV.

The district court, however, did not feel constrained by the jury verdict because it considered the question of enablement to be one of law. The court also viewed the form of the verdict as a special verdict under Rule 49(a), Fed. R. Civ. P., and not as a general verdict.

Although enablement is ultimately a question of law, *see, e.g., Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 1268, 229 USPQ 805, 810 (Fed. Cir. 1986), cert. denied, 107 S. Ct. 875 (1987), this court has recognized that there may be underlying factual issues involved, *see Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d

1446, 14 Cir. 19 (1985). such as 49(a), b subsequent explicit ar. Because the subs we need the jury

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of the claims generally in the public. If, however, the specific instrumentalities which are recognized at the best way of carrying out the best mode requirement obligation to disclose that public as well. *See Flick-Hydro-Line Mfg. Co.*, 351, 146 USPQ 694, 697 (7th Cir. 1984), *cert. denied*, 383 U.S. 958 [148 F.2d 355, 361-63, 7 (6th Cir. 1977)].

before us is one in which the disclosure more than one of the claimed invention, but only disclose the best means to the inventors. The district court that the specifications were under §112, but incorrectly on on a lack of enablement. The problem is really one of thus, while we disagree with the views on these issues, the patents are both invalid and must be sustained.

## 2. Enablement The Jury Question

essing the substance of the decision on enablement, we question, raised by Coherent, that it was free to decide enablement first considering the jury no specific question was submitted on enablement, the district court the jury that "invalid claims negated" and provided general the law of enablement. Concerns that by finding the shield, the jury implicitly decided its favor, and that the court rule these findings without determinations required by

court, however, did not feel the jury verdict because it question of enablement to be court also viewed the form of a special verdict under Rule Civ. P., and not as a general

enablement is ultimately a question, e.g., *Molekulon Research Inc.*, 793 F.2d 1261, 1268, 2290 (Fed. Cir. 1986), *cert. denied*, 875 (1987), this court has it there may be underlying involved, *see Quaker City Inc. v. Skil Corp.*, 747 F.2d

1446, 1453-54, 223 USPQ 1161, 1166 (Fed. Cir. 1984), *cert. denied*, 471 U.S. 1136 (1985). The court may submit legal issues such as enablement to the jury under Rule 49(a), but if it does, the court may not make subsequent findings which overrule an implicit and inherent finding of the jury. *Id.* Because the district court erred in applying the substantive law of enablement, however, we need not decide whether it also overruled the jury's finding.

### b. Enablement By Alternative Means

To be enabling under §112, a patent specification must disclose sufficient information to enable those skilled in the art to make and use the claimed invention. *See, e.g., Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert. denied*, 107 S. Ct. 1606 (1987). The district court held both of the patents in suit invalid for lack of enablement based on their failure to disclose Coherent's six-stage braze cycle for brazing TiCuSil. The court found that the braze cycle was "necessary to the enjoyment of the invention [sic]."

Coherent's braze cycle, however, is applicable only to TiCuSil brazing, which is just one of the ways to make and use the claimed inventions. The Hobart patent calls for "means for attaching" the copper cups to the inside of the ceramic tube and Mefferd has essentially the same step of "permanently securing" the cups to the tube. The specifications identify as suitable attachment techniques the alternatives of TiCuSil brazing, moly-manganese brazing, and low-temperature pulse-soldering.

If an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment, *In re Cook*, 439 F.2d 730, 735, 169 USPQ 298, 301 [CCPA 1971]; *In re Vickers*, 141 F.2d 522, 527, 61 USPQ 122, 127 [CCPA 1944], and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed, *see Gould v. Mossinghoff*, 711 F.2d 396, 400, 219 USPQ 393, 396 [D.C. Cir. 1983].<sup>5</sup> Thus, it is sufficient here with respect to enablement that the patents disclose at least one attachment

<sup>5</sup> This is also the logical implication of having a separate best mode requirement under §112 which contemplates that the specification can enable one to make and use the invention and still not disclose a single preferred embodiment.

means which would enable a person of ordinary skill in the art to make and use the claimed inventions. Because the patents disclose the alternatives of moly-manganese brazing and pulse-soldering, their failure to also disclose Coherent's TiCuSil braze cycle is not fatal to enablement under §112.

Spectra argues that the patents' references to the "moly-manganese process" is only in regard to low-temperature pulse-soldering, not brazing. We disagree. A fair reading of that paragraph as part of the general discussion of brazing, given that moly-manganese brazing was the most common method of bonding metal to ceramic, is that one skilled in the art would recognize that moly-manganese brazing was an alternative means of attachment. Spectra's Dave Wright, among others, testified that moly-manganese brazing was common in the industry and was well-known for brazing copper to ceramic.

The district court ignored the moly-manganese process, however, for the erroneous reason that it was "neither described nor advocated in the patents in suit." A patent need not teach, and preferably omits, what is well known in the art. *Hybritech*, 802 F.2d at 1384, 231 USPQ at 94. While there is no elaboration of moly-manganese brazing in the patent specifications, the district court found that brazing was an old and well-known technique when the applications were filed.

Spectra argues that moly-manganese brazing suitable for use in constructing the lasers of the two patents was not enabled because it required undue experimentation as evidenced by the amount of time and money it spent developing its moly-manganese process. Spectra's efforts, however, were not simply directed to finding a moly-manganese process that would work, but encompassed a whole range of enterprises necessary to making a commercially successful product. In fact, it took only three months from the time Spectra decided on a specific design for its laser until it established a workable braze technique, but it was almost another year before it made its first truly successful prototype laser.

The two major problems that Spectra claims it had to solve in order to have a successful moly-manganese process also do not show lack of enablement. For example, Spectra contends that the moly-manganese process requires the use of precision ceramic tubing, something not taught in the patent. But Steve Jarrett, charged with developing Spectra's braze process, stated that the reason he used precision tubing was to save labor costs. Likewise, Spectra claims that

Dr. Reed had to develop a special computerized striping tool to grind away circular rings from the coat of molybdenum metallization painted on the inside of the tube. A Spectra in-house report reveals, however, that stripe metallized tubes were available from the same vendors that made the ceramic tubes themselves.

As for the court's statement that molybdenum was not "advocated" in the patents, this is another matter entirely. We can only surmise that the court somehow confused the enablement requirement with the best mode.<sup>6</sup> Nonenablement is the failure to disclose *any* mode, *In re Glass*, 492 F.2d 1228, 1233, 181 USPQ 31, 35 (CCPA 1974), and does not depend on the applicant advocating a particular embodiment or method for making the invention. In practical terms, where only an alternative embodiment is enabled, the disclosure of the best mode may be inadequate. But that is a question separate and distinct from the question whether the specification enabled one to make the invention at all. *In re Gay*, 309 F.2d at 772, 135 USPQ at 315.

Finally, there is no mention at all of low-temperature pulse-soldering, except to the extent that the court considered it to be the same as the "molybdenum process." Spectra asserts that pulse-soldering could not be used in the method claimed in the Mefford patent because it permits soldering of only one cup at a time. This may be true, but it says nothing about making the structure claimed in the Hobart patent. At the very least, the court should have considered whether it was an operative alternative for making the Hobart structure.

### 3. Best Mode

#### a. The Jury Question (Again)

Coherent raises the same question with respect to best mode that we found unnecessary to decide for enablement, that is, whether the jury implicitly found that the patents disclosed the best mode. Because the district court also found for Coherent on best mode, it would seem unnecessary to decide the jury question in this context as well. It is relevant,

<sup>6</sup> One indication that the district court probably confused the concepts of enablement and best mode is the cases cited by the court in its conclusions on enablement, *Dale Electronics Inc. v. RCL Electronics, Inc.*, 488 F.2d 382, 180 USPQ 225 (1st Cir. 1973), and *Union Carbide Corp. v. Borg Warner Corp.*, 550 F.2d 355, 193 USPQ 1 (6th Cir. 1977), which deal primarily with best mode, not enablement, under §112.

however, as far as it affects the proper standard of review in this court and so we must address it.

The parties clearly intended the jury to decide best mode. The interrogatories submitted to the jury, however, failed to carry out that intent. Interrogatory 14 read as follows:

14. Did Coherent disclose the best mode known to it at the time the patent application was filed?

Yes \_\_\_\_\_ No \_\_\_\_\_

The question came back unanswered because the preamble to the question instructed the jury to consider best mode only if it had answered the preceding interrogatory on obviousness "no." The jury answered that question "yes" — but only for certain claims. The preamble to interrogatory 14 should have instructed the jury to answer best mode if the answer to obviousness was "no" or "yes" as to less than all claims.

This is the type of inadvertent omission that Rule 49(a), Fed. R. Civ. P., remedies by providing that trial by jury has been effectively waived in these circumstances. See *Quaker City Gear Works, Inc. v. Skil Corp.*, 747 F.2d 1446, 1453, 223 USPQ 1161, 1165 (Fed. Cir. 1984), cert. denied, 471 U.S. 1136 (1985) (right to trial by jury of factual issue may be waived by agreeing to instructions that jury need not answer all questions); see also 5A Moore's Federal Practice ¶ 49.03[4] (1986). Coherent's failure to object to the form of the interrogatories caused the best mode issue, by operation of Rule 49(a), to revert to the court for decision. See *Quaker City*, 747 F.2d at 1453, 223 USPQ at 1166. Thus, we review the district court's findings on best mode under the "clearly erroneous" standard of Rule 52(a), Fed. R. Civ. P., and not, as Coherent's argument suggests, as if the lower court's ruling was a denial of a motion for JNOV under Rule 50(b).

The single instruction to the jury that invalid claims cannot be infringed (a nonsense statement), one of many on supposed general principles of patent law, does not operate to convert the interrogatories on infringement into general verdicts which subsumed all of Spectra's invalidity defenses, including best mode. Any inference that the jury *implicitly* found that the best mode requirement was satisfied is negated by the preamble to interrogatory 14 which in effect told the jury that it need not consider the best mode.

#### b. Adequate Disclosure of Best Mode

Because the best mode provision of §112 speaks in terms of the best mode "contem-

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trial by jury has been effected in these circumstances. See

*Works, Inc. v. Skil Corp.*, 453, 223 USPQ 1161, 1165

*cert. denied*, 471 U.S. 1136

trial by jury of factual issue by agreeing to instructions to answer all questions); see

Federal Practice ¶ 49.03[4]

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### Disclosure of Best Mode

best mode provision of §112 of the best mode "contem-

plated by the inventor," there is no objective standard by which to judge the adequacy of a best mode disclosure. *DeGeorge v. Bernier*, 768 F.2d 1318, 1324, 226 USPQ 758, 763 (Fed. Cir. 1985). Instead, only evidence of "concealment," whether accidental or intentional, is considered. *Id.* The specificity of disclosure required to comply with the best mode requirement must be determined by the knowledge of facts within the possession of the inventor at the time of filing the application. See *United States Dep't of Energy v. Daugherty*, 687 F.2d 438, 446, 215 USPQ 4, 11 (CCPA 1982).

Compliance with the best mode requirement, because it depends on the applicant's state of mind, is a question of fact subject to the clearly erroneous standard of review. See *McGill, Inc. v. John Zink Co.*, 736 F.2d 666, 676, 221 USPQ 944, 951 (Fed. Cir.), *cert. denied*, 469 U.S. 1037 (1984). This assumes, however, a proper legal understanding of the best mode requirement, which we find missing from the district court's analysis. In general, we do not disagree with the facts as found by the district court. It is only the court's ultimate conclusion that the best mode requirement was satisfied that we reject.

In analyzing compliance with the best mode requirement, the district court focused only on the generic rather than the specific information known to the inventors and found that neither Mefferd nor Hobart intentionally, deliberately, or accidentally "concealed the braze technique as the best mode of attaching the heat web to the alumina tube." (Findings of Fact 4 and 8.) The patent specifications make clear, however, that the best mode contemplated by the inventors, as least as far as the critical "means for attaching" the copper cups to the ceramic tube is concerned, was more than just brazing in general — it was TiCuSil active metal brazing. Coherent acknowledges as much by its references to TiCuSil as the "preferred" brazing material and by the fact that Coherent never used anything else.

The appropriate question then is not whether the inventors disclosed TiCuSil brazing *at all* — they did — but whether TiCuSil brazing was *adequately* disclosed. See *In re Sherwood*, 613 F.2d 809, 816, 204 USPQ 537, 544 (CCPA 1980), *cert. denied*, 450 U.S. 994 [210 USPQ 776] (1981). Even though there may be a general reference to the best mode, the quality of the disclosure may be so poor as to effectively result in concealment. *Id.*

The facts found by the district court, when placed in the proper framework, plainly demonstrate that the TiCuSil brazing technique

used by Coherent was not adequately disclosed. The court stated in findings of fact under the heading "ENABLEMENT":

2. The use to which Coherent put the TiCuSil braze material was, and was known to be by Coherent at the time, contrary to criteria for the use of TiCuSil as contained in the literature. and again,

9. The references to brazing as used in the patents and the extraneous texts (Kohl, Wesgo Brochure) relied upon by Coherent, do not describe for the benefit of one skilled in the art of laser construction the manner in which the Mefferd method is usable for the construction of the Hobart apparatus by means of [TiCuSil] brazing. The district court also found that the inventors were aware of the problems associated with TiCuSil:

4. The known difficulty recognized by Hobart and Mefferd in working with TiCuSil as a braze material for the purpose to which they put it is reflected in Hobart's disclosure dated March 1, 1979 . . . that the titanium-copper-silver process is "not in high favor in the ceramic industry" and "not preferred as compared with what is called the moly-manganese technique which produces stronger and also less leak-prone seals" and essentially the same language in the May, 1979 patent disclosure signed by all of Hobart, Mefferd and Johnston.

Coherent admits that its braze cycle is not disclosed in either patent nor is it contained in the prior art. Instead, it maintains that its braze cycle is unique to its ovens, and because the performance of industrial ovens varies considerably, the actual parameters would be meaningless to someone who used a different oven. In support of its position, Coherent cites *In re Gay*, 309 F.2d at 769, 135 USPQ at 316, which states that "[n]ot every last detail is to be described, else patent specifications would turn into production specifications, which they were never meant to be." In doing so, however, Coherent was not discussing whether it had complied with the best mode requirement because the court had held in its favor on that issue; it was discussing whether it had complied with the enablement requirement on which the court had held against it.

First, it is not up to the courts to decide how an inventor should disclose the best mode, but whether he has done so adequately under the statute. *Weil v. Fritz*, 601 F.2d 551, 555, 202 USPQ 447, 450 (CCPA 1979). Second, far from being a "production specification," Coherent did not disclose any details about its brazing process. It is this

complete lack of detail which effectively resulted in its concealment.

Where the district court went wrong on the law while reaching the right result is starkly revealed in its conclusions of law. Under the heading of "BEST MODE" is this conclusion:

4. There was no concealment deliberate or otherwise by Hobart or Mefferd of the brazing process as the best mode of bonding the heating web to the alumina tube. As we have pointed out, however, this refers to brazing in general, not the actual brazing cycle with TiCuSil and all of the parameters which Coherent found to be its best mode, admittedly not disclosed. In contrast, but under the heading "ENABLEMENT," is the key conclusion of law which supports our conclusion and the judgment, reading as follows:

3. The six stage braze cycle employed by Coherent, and developed by it, are [sic, is] necessary to the enjoyment of the invention taught by the patents in suit by a person skilled in the art of laser construction, and are [sic] not sufficiently disclosed by the patents in suit. [Original emphasis.]

For reasons above explained, Coherent's failure to disclose its "six stage braze cycle" fully supports the defense of non-compliance with the best mode requirement of the first paragraph of §112 although the inventions as broadly claimed could be practiced without knowledge of it, which means that the patent specifications are enabling. The trial court evidently had a grasp on the essential facts but somehow got them into the wrong legal pigeonholes. With the aid of lawyers, this is not difficult to do.

Spectra's claim in this declaratory judgment complaint that the two patents in suit are invalid must therefore be sustained on the ground that they fail to disclose the best mode contemplated by the inventors for practicing their respective inventions. 35 USC 112 and 282.

#### 4. Attorney Fees

The primary basis for Spectra's request for attorney fees is Coherent's supposedly bad faith conduct during litigation, specifically the manipulation and suppression of evidence. While bad faith conduct during litigation may make a case exceptional under 35 USC 285, see, e.g., *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 455, 227 USPQ 293, 298 (Fed. Cir. 1985); judgments of a district court concerning good and bad faith are not easily overturned, *Western Marine Electronics v. Furuno Elec. Co.*, 764

F.2d 840, 847, 226 USPQ 334, 339 (Fed. Cir. 1985).

Spectra lists alleged abuses by Coherent, all presented to the court below and found unconvincing. Spectra has not shown that the court's implicit determination that this was not an exceptional case was erroneous or that the court abused its discretion by denying Spectra its attorney fees. See *Reactive Metals Alloys Corp. v. ESM, Inc.*, 769 F.2d 1578, 1582-83, 226 USPQ 821, 824 (Fed. Cir. 1985). Furthermore, we see no need to remand as in *S.C. Johnson & Sons Inc. v. Carter-Wallace, Inc.*, 781 F.2d 198, 201, 228 USPQ 367, 369 (Fed. Cir. 1986), where the court's reasons can be readily inferred from the record and arguments made below.

#### 5. Other Issues

Because we affirm the judgment that the Hobart and Mefferd patents are invalid, we need not decide the other issues presented by Coherent's appeal and Spectra's cross-appeal, namely, those relating to the jury instruction on obviousness, inventorship of the shield claims, and derivation from Wright and Riley.

#### CONCLUSION

The judgment of the district court that the Hobart and Mefferd patents are both invalid is affirmed but on a different ground than that relied on by the court below. We hold that both patents are invalid under §112, first paragraph, for failure to disclose the best mode, not for lack of enablement as the district court held.

The district court's denial of Spectra's request for attorney fees is affirmed.

#### AFFIRMED

Archer, Circuit Judge, concurring.

I join the opinion of the majority, except that I find no basis for the majority's comment regarding the "aid of [the] lawyers." The record on appeal does not indicate that the lawyers misled the court or otherwise affirmatively contributed to the court's error regarding enablement and best mode which, whether or not intended, seems to be the implication of the comment.